

COSEWIC
Assessment and Status Report

on the

Western Screech-Owl *kennicottii* subspecies
Megascops kennicottii kennicottii

and the

Western Screech-Owl *macfarlanei* subspecies
Megascops kennicottii macfarlanei

in Canada



THREATENED
2012

COSEWIC
Committee on the Status
of Endangered Wildlife
in Canada



COSEPAC
Comité sur la situation
des espèces en péril
au Canada

COSEWIC status reports are working documents used in assigning the status of wildlife species suspected of being at risk. This report may be cited as follows:

COSEWIC. 2012. COSEWIC assessment and status report on the Western Screech-Owl *kennicottii* subspecies *Megascops kennicottii kennicottii* and the Western Screech-Owl *macfarlanei* subspecies *Megascops kennicottii macfarlanei* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xii + 30 pp. (www.registrelep-sararegistry.gc.ca/default_e.cfm).

Previous report(s):

COSEWIC. 2002. COSEWIC assessment and update status report on the Western Screech-owl *otus kennicottii* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. vi + 31 pp.

Kirk, D.A. 1995. COSEWIC status report on the Western Screech-owl *Otus kennicottii* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. 16 pp.

Production note:

COSEWIC would like to acknowledge Richard J. Cannings for writing the status report on Western Screech-Owl *Megascops kennicottii* in Canada, prepared under contract with Environment Canada. This report was overseen and edited by Marty Leonard, Co-chair of the COSEWIC Birds Specialist Subcommittee.

For additional copies contact:

COSEWIC Secretariat
c/o Canadian Wildlife Service
Environment Canada
Ottawa, ON
K1A 0H3

Tel.: 819-953-3215

Fax: 819-994-3684

E-mail: COSEWIC/COSEPAC@ec.gc.ca

<http://www.cosewic.gc.ca>

Également disponible en français sous le titre Évaluation et Rapport de situation du COSEPAC sur le Petit-duc des montagnes de la sous-espèce *kennicottii* (*Megascops kennicottii kennicottii*) et le Petit-duc des montagnes de la sous-espèce *macfarlanei* (*Megascops kennicottii macfarlanei*) au Canada.

Cover illustration/photo:

Western Screech-Owl — Photo Credit: Stephen R. Cannings.

©Her Majesty the Queen in Right of Canada, 2012.

Catalogue No. CW69-14/18-2012E-PDF

ISBN 978-1-100-20711-7



Recycled paper



COSEWIC Assessment Summary

Assessment Summary – May 2012

Common name

Western Screech-Owl *kennicottii* subspecies

Scientific name

Megascops kennicottii kennicottii

Status

Threatened

Reason for designation

This small owl has shown serious declines in the southern part of its range in Metro Vancouver, Victoria and the Gulf Islands areas, where it has nearly disappeared over the last 10 to 15 years. Based on observed declines reported in Alaska, it has likely also declined in the northern part of its range, but the magnitude of the decline is unknown. The population is thought to be relatively small (less than 10,000 adults) and the owls face ongoing threats including predation from newly established populations of Barred Owls, and the removal of dead trees and snags, which serve as nest sites and roosts.

Occurrence

British Columbia

Status history

Species considered in April 1995 and placed in the Data Deficient category. It was split according to subspecies in May 2002. The *kennicottii* subspecies was designated Special Concern in May 2002. Status re-examined and designated Threatened in May 2012.

Assessment Summary – May 2012

Common name

Western Screech-Owl *macfarlanei* subspecies

Scientific name

Megascops kennicottii macfarlanei

Status

Threatened

Reason for designation

The Canadian population of this owl is small, numbering between 350 and 500 adults, but is larger than previously estimated based on recent survey effort and has a much wider range in southern British Columbia than previously thought. The population has been apparently stable over the last 10 years, but faces ongoing threats especially from the loss of mature trees needed for nesting and roost sites. The loss of these trees is associated with urban and agricultural developments and degradation of riparian woodlands.

Occurrence

British Columbia

Status history

Species considered in April 1995 and placed in the Data Deficient category. It was split according to subspecies in May 2002. The *macfarlanei* subspecies was designated Endangered in May 2002. Status re-examined and designated Threatened in May 2012.



COSEWIC Executive Summary

Western Screech-Owl *kennicottii* subspecies *Megascops kennicottii kennicottii*

and the

Western Screech-Owl *macfarlanei* subspecies *Megascops kennicottii macfarlanei*

Wildlife Species Description and Significance

The Western Screech-Owl, Petit-duc des montagnes in French, is one of two species in the genus *Megascops* in Canada. It is a small owl with distinct "ear" tufts and yellow eyes; sexes are alike. There are two distinct subspecies in Canada: the *kennicottii* subspecies along the Pacific coast and the *macfarlanei* subspecies in the valleys of the southern interior of British Columbia.

Distribution

The Western Screech-Owl is found at low elevations in Pacific coastal forests, and at lower elevations from the southern interior of British Columbia south through mountain valleys to northwestern Mexico. In Canada, it is found in coastal British Columbia (except Haida Gwaii) and in the valleys of southern British Columbia from Lillooet, Kamloops, Lumby, Slokan, Creston and Cranbrook south to the US border.

Habitat

The *kennicottii* subspecies is found in a variety of coniferous and mixed forests, but is often associated with riparian zones with Broadleaf Maple or Black Cottonwood. The *macfarlanei* subspecies is strongly associated with riparian woodlands dominated by Black Cottonwood, Water Birch or Trembling Aspen, usually located in a matrix of dry coniferous forests dominated by Ponderosa Pine or Douglas-fir. Both subspecies nest in natural tree cavities or holes excavated by larger woodpeckers, and will use appropriate nest boxes.

Biology

The Western Screech-Owl is nonmigratory; pairs defend territories year-round. They are generalist predators, feeding primarily on small mammals and large insects, but also small birds, fish, frogs, and slugs. Young birds disperse from their natal territories in late summer.

Population Sizes and Trends

Populations of the *kennicottii* subspecies in southwestern British Columbia, especially around Metro Vancouver and Victoria, have all but disappeared in the past 10 to 15 years. Populations in northern Vancouver Island appear relatively healthy, but long-term trends are unknown. The subspecies has also likely declined in central and northern coastal forests, but the magnitude of the decline is unknown. Populations of the *macfarlanei* subspecies likely decreased throughout the 1900s because of habitat loss, but seem relatively stable or declining very slowly at present. The *kennicottii* subspecies in Canada is poorly known, but estimated to be about 1500-3000 individuals. The *macfarlanei* subspecies is less abundant, likely numbering 350-500 individuals.

Threats and Limiting Factors

Habitat loss is the primary threat to the *macfarlanei* subspecies and has likely affected the *kennicottii* subspecies as well. Predation by the newly arrived Barred Owl is thought to be the primary cause of significant population declines of the *kennicottii* subspecies on the south coast.

Protection, Status, and Ranks

The *macfarlanei* subspecies is listed as Endangered under the federal *Species at Risk Act*; the *kennicottii* subspecies is listed as a species of Special Concern based on the May 2002 COSEWIC assessments. In British Columbia, the species and active nests are protected from direct harm under the *Wildlife Act*; the *macfarlanei* subspecies is on the British Columbia Red List (potentially Threatened or Endangered) and the *kennicottii* subspecies is on the Blue List (Special Concern).

TECHNICAL SUMMARY - *KENNICOTTII* SUBSPECIES

Megascops kennicottii kennicottii

Western Screech-Owl, *kennicottii* subspecies

Petit-duc des montagnes de la sous-espèce
kennicottii

Range of occurrence in Canada: BC

Demographic Information

Generation time (usually average age of parents in the population; indicate if another method of estimating generation time indicated in the IUCN guidelines (2008) is being used)	3 yrs
Is there an [observed, inferred, or projected] continuing decline in number of mature individuals?	Yes
Estimated percent of continuing decline in total number of mature individuals within [5 years or 2 generations]	Unknown
[Observed, estimated, inferred, or suspected] percent [reduction or increase] in total number of mature individuals over the last [10 years, or 3 generations].	>90% loss in Metro Vancouver, Victoria and the Gulf Island areas and overall decrease estimated at 20-30% between 1995 and 2010
[Projected or suspected] percent [reduction or increase] in total number of mature individuals over the next [10 years, or 3 generations].	Unknown
[Observed, estimated, inferred, or suspected] percent [reduction or increase] in total number of mature individuals over any [10 years, or 3 generations] period, over a time period including both the past and the future.	Unknown
Are the causes of the decline clearly reversible and understood and ceased?	Not readily reversible, fairly well understood, not ceased
Are there extreme fluctuations in number of mature individuals?	No

Extent and Occupancy Information

Estimated extent of occurrence	Ca. 150,000 km ²
Index of area of occupancy (IAO) (Always report 2x2 grid value; other values may also be listed if they are clearly indicated (e.g., 1x1 grid, biological AO)). <i>Based on assumption of 1000 pairs, each occupying a 2 km X 2 km grid cell</i>	Ca. 4000 km ²
Is the total population severely fragmented?	No
Number of locations*	Unknown, but greater than 10
Is there an [observed, inferred, or projected] continuing decline in extent of occurrence? <i>Based on >90% loss in Metro Vancouver, Victoria and the Gulf Island areas</i>	Yes - observed
Is there an [observed, inferred, or projected] continuing decline in index of area of occupancy? <i>Based on >90% loss in Metro Vancouver, Victoria and the Gulf Island areas</i>	Yes - observed
Is there an [observed, inferred, or projected] continuing decline in number of populations?	No

* See definition of location.

Is there an [observed, inferred, or projected] continuing decline in number of locations**?	Unknown
Is there an [observed, inferred, or projected] continuing decline in [area, extent and/or quality] of habitat?	Yes / observed / area, extent and quality
Are there extreme fluctuations in number of populations?	No
Are there extreme fluctuations in number of locations*?	No
Are there extreme fluctuations in extent of occurrence?	No
Are there extreme fluctuations in index of area of occupancy?	No

Number of Mature Individuals (in each population)

Population	N Mature Individuals
Total	1500-3000

Quantitative Analysis

Probability of extinction in the wild is at least [20% within 20 years or 5 generations, or 10% within 100 years].	Not done
--	----------

Threats (actual or imminent, to populations or habitats)

1. Predation by Barred Owls is a serious concern, especially on the south coast.
2. Habitat loss, degradation and fragmentation in both urban/suburban habitats and where clear-cut logging has radically altered the age structure of the forest and removed nest and roost sites.
3. Road kill can be a significant cause of mortality.

Rescue Effect (immigration from outside Canada)

Status of outside population(s)? Declining	
Is immigration known or possible?	Yes
Would immigrants be adapted to survive in Canada?	Yes
Is there sufficient habitat for immigrants in Canada?	Yes
Is rescue from outside populations likely?	No
<i>Declines in U.S. population make rescue unlikely</i>	

Current Status

COSEWIC: Special Concern 2002, Threatened (May, 2012)

Status and Reasons for Designation

Status: Threatened	Alpha-numeric code: C1
Reasons for designation: This small owl has shown serious declines in the southern part of its range in Metro Vancouver, Victoria and the Gulf Islands areas, where it has nearly disappeared over the last 10 to 15 years. Based on observed declines reported in Alaska, it has likely also declined in the northern part of its range, but the magnitude of the decline is unknown. The population is thought to be relatively small (less than 10,000 adults) and the owls face ongoing threats including predation from newly established populations of Barred Owls, and the removal of dead trees and snags, which serve as nest sites and roosts.	

* See definition of location.

Applicability of Criteria

Criterion A (Decline in Total Number of Mature Individuals): Does not clearly meet criterion. Significant declines observed in southern parts of the range in Metro Vancouver, Victoria and the Gulf Islands areas and declines likely in northern parts, but magnitude is unknown. Crude estimates suggest overall declines of 20 to 30% over the last 10 to 15 years.

Criterion B (Small Distribution Range and Decline or Fluctuation): Does not meet criterion. EO is > 20,000 km² and IAO is > 2,000 km².

Criterion C (Small and Declining Number of Mature Individuals): Meets Criterion C1 because population is less than 10,000 individuals and because a continuing decline of at least 10% is anticipated over the next 10 years based on current rates of decline and ongoing threats.

Criterion D (Very Small or Restricted Total Population): Does not meet criterion. Population is > 1000 mature individuals, IAO is > 20 km² and it occurs in more than five locations.

Criterion E (Quantitative Analysis): Analyses not conducted.

TECHNICAL SUMMARY - *MACFARLANEI* SUBSPECIES

Megascops kennicottii macfarlanei
Western Screech-Owl, *macfarlanei* subspecies

Petit-duc des montagnes, *macfarlanei*
subspecies

Range of occurrence in Canada: BC

Demographic Information

Generation time (usually average age of parents in the population; indicate if another method of estimating generation time indicated in the IUCN guidelines (2008) is being used)	3 yrs
Is there an [observed, inferred, or projected] continuing decline in number of mature individuals?	No, appears to be stable
Estimated percent of continuing decline in total number of mature individuals within [5 years or 2 generations]	N/A
[Observed, estimated, inferred, or suspected] percent [reduction or increase] in total number of mature individuals over the last [10 years, or 3 generations].	N/A
[Projected or suspected] percent [reduction or increase] in total number of mature individuals over the next [10 years, or 3 generations].	N/A
[Observed, estimated, inferred, or suspected] percent [reduction or increase] in total number of mature individuals over any [10 years, or 3 generations] period, over a time period including both the past and the future.	N/A
Are the causes of the decline clearly reversible and understood and ceased?	N/A
Are there extreme fluctuations in number of mature individuals?	No

Extent and Occupancy Information

Estimated extent of occurrence	Ca. 50,000 km ²
Index of area of occupancy (IAO) (Always report 2x2 grid value; other values may also be listed if they are clearly indicated (e.g., 1x1 grid, biological AO)). <i>Based on a 2 km X 2 km grid overlaid on known sites</i>	616 km ²
Is the total population severely fragmented?	No
Number of locations*	Unknown, but greater than 10
Is there an [observed, inferred, or projected] continuing decline in extent of occurrence?	No
Is there an [observed, inferred, or projected] continuing decline in index of area of occupancy?	No
Is there an [observed, inferred, or projected] continuing decline in number of populations?	No
Is there an [observed, inferred, or projected] continuing decline in number of locations*?	Unknown
Is there an [observed, inferred, or projected] continuing decline in [area, extent and/or quality] of habitat?	Yes / observed / area, extent and quality
Are there extreme fluctuations in number of populations?	No
Are there extreme fluctuations in number of locations*?	No
Are there extreme fluctuations in extent of occurrence?	No
Are there extreme fluctuations in index of area of occupancy?	No

* See definition of location.

Number of Mature Individuals (in each population)

Population	N Mature Individuals
Total	Ca. 350-500

Quantitative Analysis

Probability of extinction in the wild is at least [20% within 20 years or 5 generations, or 10% within 100 years].	Not done
--	----------

Threats (actual or imminent, to populations or habitats)

1. Habitat loss, degradation and fragmentation, affecting the abundance, distribution and quality of riparian woodlands. Most of this habitat loss is the result of urban and agricultural developments.
2. Predation by Barred Owls is a concern on the edges of the subspecies' range in BC.
3. Road kill can be a significant cause of mortality.

Rescue Effect (immigration from outside Canada)

Status of outside population(s)? Stable?	
Is immigration known or possible?	Yes
Would immigrants be adapted to survive in Canada?	Yes
Is there sufficient habitat for immigrants in Canada?	Perhaps, but slowly declining
Is rescue from outside populations likely?	Possible

Current Status

COSEWIC: Endangered 2002, Threatened (May, 2012)
--

Status and Reasons for Designation

Status: Threatened	Alpha-numeric code: D1
Reasons for designation: The Canadian population of this owl is small, numbering between 350 and 500 adults, but is larger than previously estimated based on recent survey effort and has a much wider range in southern British Columbia than previously thought. The population has been apparently stable over the last 10 years, but faces ongoing threats especially from the loss of mature trees needed for nesting and roost sites. The loss of these trees is associated with urban and agricultural developments and degradation of riparian woodlands.	

Applicability of Criteria

Criterion A (Decline in Total Number of Mature Individuals): Does not meet criterion. Population apparently stable over the last 10 years.
Criterion B (Small Distribution Range and Decline or Fluctuation): Does not meet criterion. EO is > than thresholds. IAO is < 2000 km ² , but number of locations is greater than 10, and there is no evidence for severe fragmentation or extreme fluctuations in EO, IAO, populations or number of mature individuals.
Criterion C (Small and Declining Number of Mature Individuals): Does not meet criterion. The total number of mature individuals is <2500; however, there is no evidence of a continuing decline.
Criterion D (Very Small or Restricted Total Population): Meets Threatened D1 because the population is estimated to be <1000 mature individuals.
Criterion E (Quantitative Analysis): Analyses not conducted.

PREFACE

Since the species was last assessed in 2002, there has been considerable inventory work throughout the range of the interior subspecies, *Megascops kennicottii macfarlanei*. The population is now thought to be larger than estimated previously (350 to 500 instead of 80 to 200 individuals) and the breeding range is known to include the Kootenay region, the southernmost Flathead Valley, and at least the edge of the Shuswap region. There is also a population along the Fraser River and its tributaries in the Lillooet area that is presumably part of *M. k. macfarlanei*. The coastal subspecies *M. k. kennicottii* has been less thoroughly studied in the past decade, but there are strong indications that the species is now very rare in its range around Metro Vancouver, the Gulf Islands, and southeastern Vancouver Island.



COSEWIC HISTORY

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) was created in 1977 as a result of a recommendation at the Federal-Provincial Wildlife Conference held in 1976. It arose from the need for a single, official, scientifically sound, national listing of wildlife species at risk. In 1978, COSEWIC designated its first species and produced its first list of Canadian species at risk. Species designated at meetings of the full committee are added to the list. On June 5, 2003, the *Species at Risk Act* (SARA) was proclaimed. SARA establishes COSEWIC as an advisory body ensuring that species will continue to be assessed under a rigorous and independent scientific process.

COSEWIC MANDATE

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) assesses the national status of wild species, subspecies, varieties, or other designatable units that are considered to be at risk in Canada. Designations are made on native species for the following taxonomic groups: mammals, birds, reptiles, amphibians, fishes, arthropods, molluscs, vascular plants, mosses, and lichens.

COSEWIC MEMBERSHIP

COSEWIC comprises members from each provincial and territorial government wildlife agency, four federal entities (Canadian Wildlife Service, Parks Canada Agency, Department of Fisheries and Oceans, and the Federal Biodiversity Information Partnership, chaired by the Canadian Museum of Nature), three non-government science members and the co-chairs of the species specialist subcommittees and the Aboriginal Traditional Knowledge subcommittee. The Committee meets to consider status reports on candidate species.

DEFINITIONS (2012)

Wildlife Species	A species, subspecies, variety, or geographically or genetically distinct population of animal, plant or other organism, other than a bacterium or virus, that is wild by nature and is either native to Canada or has extended its range into Canada without human intervention and has been present in Canada for at least 50 years.
Extinct (X)	A wildlife species that no longer exists.
Extirpated (XT)	A wildlife species no longer existing in the wild in Canada, but occurring elsewhere.
Endangered (E)	A wildlife species facing imminent extirpation or extinction.
Threatened (T)	A wildlife species likely to become endangered if limiting factors are not reversed.
Special Concern (SC)*	A wildlife species that may become a threatened or an endangered species because of a combination of biological characteristics and identified threats.
Not at Risk (NAR)**	A wildlife species that has been evaluated and found to be not at risk of extinction given the current circumstances.
Data Deficient (DD)***	A category that applies when the available information is insufficient (a) to resolve a species' eligibility for assessment or (b) to permit an assessment of the species' risk of extinction.

* Formerly described as "Vulnerable" from 1990 to 1999, or "Rare" prior to 1990.

** Formerly described as "Not In Any Category", or "No Designation Required."

*** Formerly described as "Indeterminate" from 1994 to 1999 or "ISIBD" (insufficient scientific information on which to base a designation) prior to 1994. Definition of the (DD) category revised in 2006.



Environment
Canada

Canadian Wildlife
Service

Environnement
Canada

Service canadien
de la faune

Canada

The Canadian Wildlife Service, Environment Canada, provides full administrative and financial support to the COSEWIC Secretariat.

COSEWIC Status Report

on the

Western Screech-Owl *kennicottii* subspecies
Megascops kennicottii kennicottii

and the

Western Screech-Owl *macfarlanei* subspecies
Megascops kennicottii macfarlanei

in Canada

2012

TABLE OF CONTENTS

WILDLIFE SPECIES DESCRIPTION AND SIGNIFICANCE	4
Name and Classification	4
Morphological Description	6
Population Spatial Structure and Variability	6
Designatable Units	7
Special Significance	7
DISTRIBUTION	7
Global Range	7
Canadian Range	7
Search Effort	10
HABITAT	11
Habitat Requirements	11
Habitat Trends	13
BIOLOGY	14
Life Cycle and Reproduction	14
Physiology and Adaptability	15
Dispersal and Migration	15
Interspecific Interactions	15
POPULATION SIZES AND TRENDS	16
Sampling Effort and Methods	16
Abundance	17
Fluctuations and Trends	18
Rescue Effect	21
THREATS AND LIMITING FACTORS	22
Habitat Loss	22
Barred Owls	22
Road Kill	23
PROTECTION, STATUS, AND RANKS	24
Legal Protection and Status	24
Non-Legal Status and Ranks	24
Habitat Protection and Ownership	24
ACKNOWLEDGEMENTS AND AUTHORITIES CONTACTED	25
Authorities contacted:	25
INFORMATION SOURCES	26
BIOGRAPHICAL SUMMARY OF REPORT WRITER(S)	30
COLLECTIONS EXAMINED	30

List of Figures

- Figure 1. Western Screech-Owl (Stephen R. Cannings photo). 4
- Figure 2. Range of the Western Screech-Owl, showing subspecies (from Cannings and Angell 2001). 5
- Figure 3. Range of the Western Screech-Owl in British Columbia. Range of interior species *M. k. macfarlanei* shown in black; that of coastal subspecies *M. k. kennicottii* shown in red. Coastal range shown is all land below 300 m elevation, excluding Haida Gwaii. 8
- Figure 4. Sites of Western Screech-Owl sightings in the British Columbia interior (*M. k. macfarlanei*). Breeding season sites are orange, nonbreeding green; dark colours are extant sites (2001 to present) and light colours historical. 9
- Figure 5. Frequency (owls per hour of nocturnal effort) of Western Screech-Owl (*M. k. kennicottii*) (squares) and Barred Owl (triangles) sightings on seven south coastal Christmas Bird Counts 1983-2009 (Duncan, Ladner, Nanaimo, Sunshine Coast, Vancouver, Victoria, White Rock). 19
- Figure 6. The frequency (owls per 10 stops) of Western Screech-Owl detections from coastal routes (squares) and southern interior routes (diamonds) on the BC-Yukon Nocturnal Owl Survey. Sample size for coastal routes ranges from 15 to 64 routes and from 25 to 55 for interior routes. Note: all but two coastal routes are from the south coast. 19

WILDLIFE SPECIES DESCRIPTION AND SIGNIFICANCE

Name and Classification

Scientific name: *Megascops kennicottii*

English name: Western Screech-Owl

French name: Petit-duc des montagnes

Classification: Class Aves, Order Strigiformes, Family Strigidae

The Western Screech-Owl (*Megascops kennicottii*, Figure 1) was formerly considered conspecific with the Eastern Screech-Owl (*Megascops asio*) (AOU 1957) but was recognized as a separate species in 1983 (AOU 1983). It was also formerly placed in the genus *Otus*, but because of distinctive vocal differences, the New World *Otus* species (except for the Flammulated Owl, *O. flammeolus*) are now placed in *Megascops* (Banks *et al.* 2003).



Figure 1. Western Screech-Owl (Stephen R. Cannings photo).

The taxonomy of subspecies of the Western Screech-Owl remains complex and uncertain. The American Ornithologists' Union (AOU 1998) recognizes two broad groups: *M. kennicottii* (Western Screech-Owl) and *M. vinaceus* (Vinaceous Screech-Owl), which are now considered conspecific because they intergrade and have similar vocalizations. The Western Screech-Owl has been divided into numerous and differing numbers of subspecies (Figure 2). Marshall (1967) recognized eight subspecies and Hekstra (1982) recognized 18 subspecies. Cannings and Angell (2001) accepted Marshall's scheme but also recognized *M. k. macfarlanei* (which Marshall had merged with *M. k. bendirei*) because its large size, greyish colouration and interior range clearly separated it from both *M. k. bendirei* and *M. k. kennicottii*. Proudfoot *et al.*'s (2007) genetic analysis supported the validity of *M. k. macfarlanei*, but suggested merging the south coastal (California) *M. k. bendirei* with the north coastal (Oregon to Alaska) *M. k. kennicottii*.

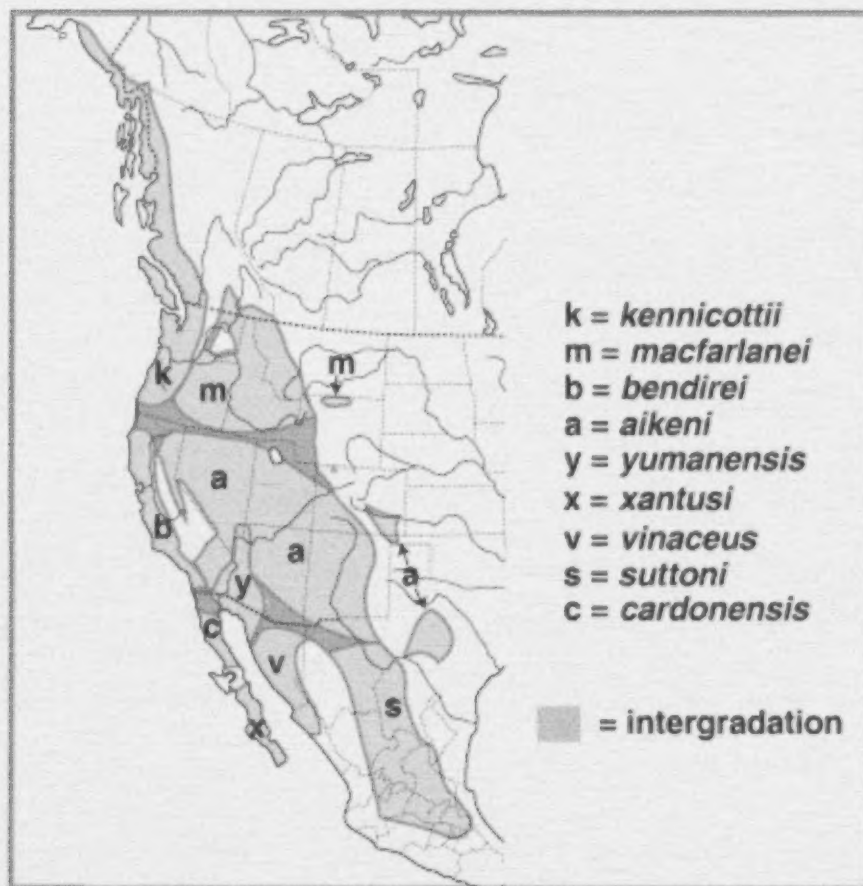


Figure 2. Range of the Western Screech-Owl, showing subspecies (from Cannings and Angell 2001).

There are two subspecies recognized within Canada: *Megascops kennicottii kennicottii* in most of coastal British Columbia and *M. k. macfarlanei* in the southern interior of British Columbia. The birds seen irregularly in Alberta and Saskatchewan would belong to *M. k. macfarlanei* as well. Birds breeding on southeastern Vancouver Island have been considered a separate subspecies (*M. k. saturatus*, e.g. Hekstra 1982), but that form is now considered part of *M. k. kennicottii* (Marshall 1967; Cannings and Angell 2001).

Morphological Description

The Western Screech-Owl is a small owl with 'ear tufts' and yellow eyes. Adults range in length from 19 to 25.5 cm and weigh between 120 and 305 g (Cannings and Angell 2001). Sexes are monomorphic in plumage, but females are generally larger and heavier than males (Earhart and Johnson 1970; Johnson 1997; Cannings and Angell 2001). These owls are grey-brown overall with fine dark vermiculations on a whitish breast, and mottled streaks throughout the rest of the plumage. A small percentage of *M. k. kennicottii* birds are reddish-brown (Johnsgard 1988; Cannings and Angell 2001). *M. k. macfarlanei* are larger and generally paler than *M. k. kennicottii* (Bent 1938; Godfrey 1986).

The Eastern Screech-Owl is difficult to distinguish from the Western Screech-Owl, but in Canada the ranges do not overlap, so confusion is unlikely. They are easily identified by their vocalizations. The typical territorial call of the Western Screech-Owl is a series of whistled hoots that gradually speed up throughout the call; the territorial call of the Eastern Screech-Owl is a descending whinny. The Western Screech-Owl also has a double trill call; the corresponding call of the Eastern is a long single trill.

Population Spatial Structure and Variability

Proudfoot *et al.* (2007) used sequences of the mitochondrial cytochrome b gene (930 base pairs) to examine patterns of variation within the Western Screech-Owl. From a sample of 21 specimens, their results suggested at least three subspecies groupings within the species: 1) *M. k. macfarlanei* in the northern interior part of the species' range, 2) *M. k. kennicottii/bendirei* on the Pacific coast and 3) *M. k. aikenii/suttoni/yumanensis* in southwestern deserts (Nevada and Utah south to Mexico). The first two groups differed from one another by 1%, whereas both differed from the third group by 3%. The *M. k. kennicottii* material they examined came from Washington, while the *M. k. macfarlanei* material came from Idaho and Montana.

Designatable Units

This report presumes that there are two designatable units in Canada, i.e. the two subspecies, *M. k. kennicottii* and *M. k. macfarlanei*.

The taxonomic affinities of the Western Screech-Owls around Lillooet and Cache Creek remain uncertain, because those birds likely contact populations of *M. k. kennicottii* in the Fraser Canyon and Pemberton Valley. For this report, however, birds in the Lillooet area will be considered *M. k. macfarlanei*, because they tend to be long-winged, greyish, and occupy habitats similar to those used by screech-owls in the Okanagan Valley to the east.

Special Significance

The Western Screech-Owl is considered an indicator species for a healthy riparian woodland environment. There is no Aboriginal Traditional Knowledge available for this species.

DISTRIBUTION

Global Range

The Western Screech-Owl is found from south coastal Alaska, coastal British Columbia and the southern interior of British Columbia south through the western mountains to Baja California, Sinaloa, Chihuahua and the Distrito Federal (Figure 2).

Canadian Range

The Western Screech-Owl *kennicottii* subspecies is resident in the coastal forests of British Columbia (Figure 3), though absent from Haida Gwaii. *M. k. macfarlanei* is found locally in riparian woodlands in the southern Interior of British Columbia (Big Bar, Lillooet, Cache Creek, Lumby, Grand Forks, Slocan, Flathead Valley, Creston and Cranbrook south to the US border). The distribution of sightings of the interior subspecies *M. k. macfarlanei* is shown in Figure 4. Despite the presence of apparently suitable habitat, the species is largely absent from the Nicola Valley and the Thompson Valley between Kamloops and Shuswap Lake.

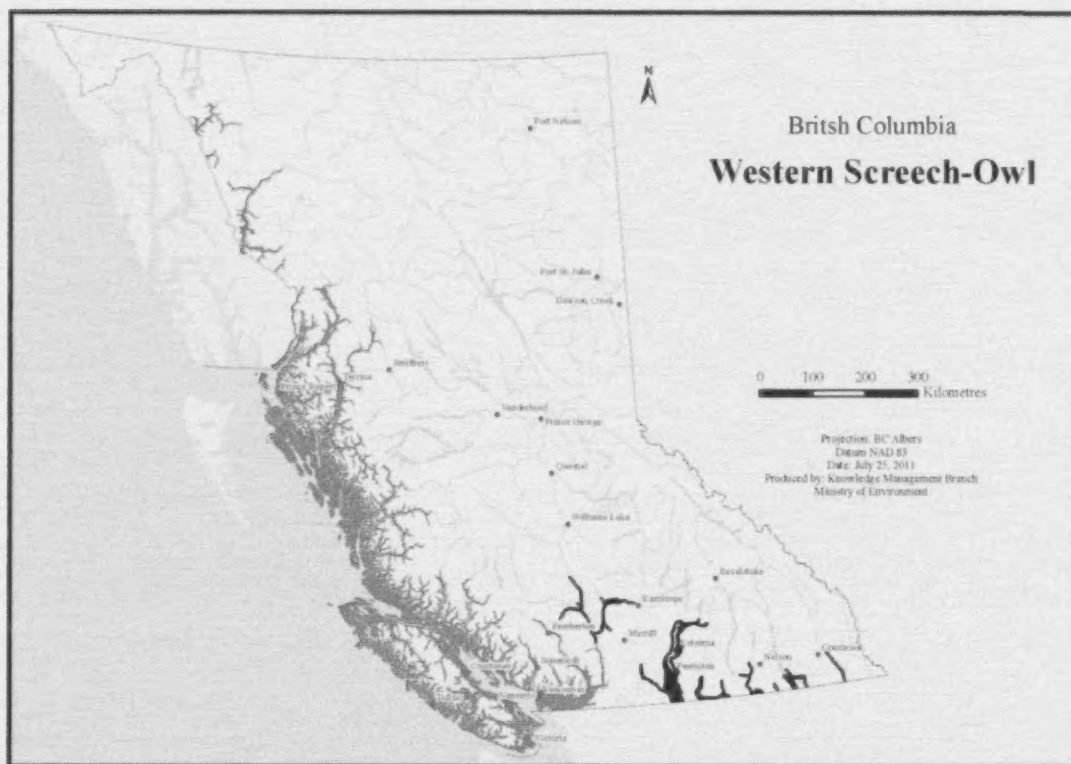


Figure 3. Range of the Western Screech-Owl in British Columbia. Range of interior species *M. k. macfarlanei* shown in black; that of coastal subspecies *M. k. kennicottii* shown in red. Coastal range shown is all land below 300 m elevation, excluding Haida Gwaii.



Figure 4. Sites of Western Screech-Owl sightings in the British Columbia interior (*M. k. macfarlanei*). Breeding season sites are orange, nonbreeding green; dark colours are extant sites (2001 to present) and light colours historical.

There are only a handful of records from Alberta and Saskatchewan and the species presumably does not breed in those provinces. Semenchuk (1992) listed the species as a vagrant in Alberta and it is not mentioned at all in the second Alberta Breeding Bird Atlas (Federation of Alberta Naturalists 2007). There are two records from Waterton Lakes National Park in the southwestern corner of Alberta as well as single records from Cardston and Lethbridge (Sharp 1973; Pinel *et al.* 1991). In Saskatchewan, the species is listed as hypothetical; the most certain record of the species in Saskatchewan is of birds calling in the springs of 1992 and 1994 in the Cypress Hills in southwestern Saskatchewan (Smith 1996).

The extent of occurrence (EO), based on a minimum convex polygon drawn over the range of the species in Canada, is about 300,000 km². The EO for *M. k. kennicottii* alone is about 150,000 km², while that for *M. k. macfarlanei* in Canada is about 50,000 km². The index of area of occupancy (IAO) for *M. k. kennicottii* is estimated to be about 4000 km², based on an estimate of 1000 breeding pairs, each occupying a single 2 km X 2 km cell. The 1000 breeding pairs estimate is taken from the estimate of 2000 adults in the *M. k. kennicottii* population in Canada. The IAO for *M. k. macfarlanei* is 616 km², based on a 2 km X 2 km grid overlaid on the known sites for the subspecies. The number of locations for both subspecies is unknown but likely large.

The IAOs for both subspecies have undoubtedly decreased somewhat over the last 100 years through habitat loss; in particular, the IAO for *M. k. kennicottii* has declined over the last 10 to 20 years as screech-owls disappeared from the Metro Vancouver and Victoria areas (Elliott 2006) and the Gulf Islands (D. Fraser pers. comm.). The percent decline is unknown because of the very rough estimate of IAO for *M. k. kennicottii*, but it is probably in the 10-20% range. This decline is continuing, albeit at a slower rate. There is little indication that the IAO for *M. k. macfarlanei* has changed significantly over the past decade (Cannings and Davis 2007) but is likely slowly declining through periodic habitat losses.

Search Effort

Before 1990, there were no targeted surveys for Western Screech-Owls in Canada. Indeed, before 1970, there were few attempts to locate owls at night in British Columbia. Christmas Bird Counts have reported nocturnal search effort (owling) since 1983. These counts are done within 24-km circles on one day each year between December 14 and January 5. A total of 14 counts have reported owling effort within the species' range on the British Columbia coast (all on the south mainland coast and Vancouver Island) and at least 10 more in the southern interior of the province. Campbell *et al.* (1990) amassed all the sight records and specimen records for birds in British Columbia, including 1479 records of Western Screech-Owls. The British Columbia-Yukon Nocturnal Owl Survey (e.g. Cannings 2010) has monitored owls along road-based routes (each 10 to 30 stops long) in the species' range annually since 2000. Between 15 and 64 routes have been surveyed annually on the coast (all but 2 from the Lower Mainland, Sunshine Coast, Gulf Islands, and Vancouver Island) and 25 to 55 in the southern interior. Surveys are carried out by volunteers in February (coast) or March (interior). A playback protocol using Western Screech-Owl calls is used on coastal routes, but no playback is used on interior routes.

For information on more intensive search effort relating to Western Screech-Owl populations in Canada, see the Sampling Effort and Methods part of the Population Sizes and Trends section below.

HABITAT

Habitat Requirements

In general, Western Screech-Owls are found in a wide variety of forest and woodland habitats, but prefer riparian habitats throughout their range (Campbell *et al.* 1990; Cannings and Angell 2001). They require large trees with suitable cavities for nest sites, and often roost in these cavities as well (Cannings and Angell 2001). In British Columbia, they are found at lower elevations, generally below 600 m (Campbell *et al.* 1990).

M. k. kennicottii

Western Screech-Owls along the British Columbia coast are found in almost every type of low elevation forest and woodland (Settingington 1998; Holroyd *et al.* 2000; Mico and Van Enter 2000; Elliott 2006; Kissling and Lewis 2009), but generally prefer mixed deciduous-coniferous forests, often near a stream (Campbell *et al.* 1990). They can also be found in older residential areas with mature trees and woodland, but use of this habitat has significantly declined in the last 20 years.

In the Nimpkish Valley on northern Vancouver Island, Settingington (1998) found that the deciduous component of the forests where screech-owls were found was only about 3.7%, but this was still a statistically higher portion than in random plots where the deciduous component was about 1%. Based on forest cover maps, and not on on-the-ground vegetation surveys, the owls were found in forests with the following average characteristics: basal area of 44 m²/ha, stand age of 128 years, height of 25 m and 50% crown closure. The basal area was lower, forest age younger and crown closure less than in random plots.

M. k. macfarlanei

In the British Columbia Interior, Western Screech-Owls are restricted to the lower elevations of southern valleys. Known sites are associated with Bunchgrass (21.4%), Interior Cedar Hemlock (11.0%), Interior Douglas-fir (37.2%) and Ponderosa Pine (32.9%) biogeoclimatic zones (Cannings and Davis 2007). In this region, they are strongly associated with mature riparian woodland habitats dominated by Water Birch (*Betula occidentalis*), Black Cottonwood (*Populus balsamifera trichocarpa*) or Trembling Aspen (*Populus tremuloides*) (Cannings 1997). Davis and Weir (2010) found that home ranges of Western Screech-Owls in the Shuswap River valley were highly associated with riparian forests; most screech-owls had >10 ha of riparian forested habitats within their home ranges.

Hayward and Garton (1988) found a similar situation in central Idaho, where Western Screech-Owls were positively associated with riparian habitats and deciduous bottomlands and negatively associated with coniferous forests (Douglas-fir, *Pseudotsuga menziesii*). Hayward and Garton (1988) also found Western Screech-Owls used more bunchgrass habitat than other owls in their study area, and were restricted to the lowest elevations in the study area. Riparian habitats in Hayward and Garton's study area had abundant deciduous cover from 4 to 8 m in height.

These riparian zones are often very narrow, and individuals likely forage in adjacent open forests of Ponderosa Pine (*Pinus ponderosa*) and Douglas-fir pastures. Davis and Weir (2010) found that about half the area used by Western Screech-Owls along the Shuswap River was in upland forests.

Home ranges of interior screech-owls tend to be centred around nests, and are spaced regularly along rivers and creeks (Davis and Weir 2010). However, some screech-owl territories in the British Columbia Interior have been found in less linear habitats (e.g. in aspen stands with only minor creeks or seepages); in these habitats spacing may be more complex.

Suburban and urban areas are not generally used by Western Screech-Owls in the British Columbia interior, except as temporary foraging habitat, probably by young birds, in the nonbreeding season.

Nests and Roosts

Both subspecies use tree cavities for nest and roost sites, usually those made by Northern Flickers (*Colaptes auratus*) or Pileated Woodpeckers (*Dryocopus pileatus*) in large diameter deciduous trees (though natural cavities and coniferous trees are also used) such as Black Cottonwood, Trembling Aspen, Paper Birch (*Betula papyrifera*), and Water Birch (Campbell *et al.* 1990; Cannings and Angell 2001; Cannings and Davis 2007). Rotted out branch cavities are also used as nest sites on the coast (D. Fraser pers. comm. 2011). All nest sites reported in Campbell *et al.* (1990) were in trees larger than 25 cm diameter at breast height. As cavities are needed for both nesting and roosting, a breeding territory must contain at least two suitable sites for use by the male and female. Western Screech-Owls readily accept suitable nest boxes for nesting and roosting as well.

Open roost sites are used more often than cavities, especially in warm weather. Roosts used by six radio-tagged screech-owls along the Shuswap River were most often in Western Red Cedar (*Thuja plicata*; 78 of 140; 56%), followed by Paper Birch, hybrid spruce (*Picea glauca* x *engelmannii*), Black Cottonwood, Douglas-fir, Ponderosa Pine and willows (*Salix* spp.) (Davis and Weir 2008). Mean diameter of roost trees was 39.4 cm, but was highly variable (range 9 - 292 cm).

Robertson *et al.* (2000) recorded Western Screech-Owl roost sites around Metro Vancouver and in locations northward up the nearby mainland coast and found screech-owls most often in mixed deciduous-coniferous woods greater than 50 years old, but numerous birds were also found in a 25 to 30-year-old Douglas-fir plantation. Roosting birds were always in conifers, mostly Western Hemlock (*Tsuga heterophylla*) and Western Red Cedar. The authors suggested that dense conifer roosts were important for the survival.

Habitat Trends

M. k. kennicottii

Concerns over coastal Western Screech-Owl habitat focus on the regions of southern Vancouver Island and the Lower Mainland, where continuing urban development inevitably leads to a decline in the amount of low elevation forested habitat (Fraser *et al.* 1999; Robertson *et al.* 2000). Essentially all low elevation coastal forests in British Columbia have been cut over in the last century (Hull 1999); this likely had a large impact on habitat suitability for screech-owls, particularly in clear-cut areas where snags were removed as well as living trees (Cannings and Angell 2001).

That said, there is a great deal of seemingly suitable habitat available around urban and rural areas on the south coast of British Columbia (Lower Mainland, Gulf Islands, southern Vancouver Island, Sunshine Coast) in the form of wooded parks, woodlots and large regional parks. Most of these habitats, which once held numerous pairs of Western Screech-Owls in the 1970s and 1980s, appear to be largely unoccupied at present (Elliott 2006).

M. k. macfarlanei

More than half of the Western Screech-Owl habitat in the South Okanagan and Lower Similkameen areas has been lost over the last century (SOSCP 2005), and the primary habitat for screech-owls in this area—mature Water Birch—has declined by about 87%. Another important habitat type—cottonwood forests—have declined by about a third in area (SOSCP 2005). Similar data are not available for the rest of the range of the owl in the British Columbia interior, but it is clear that this pattern of significant loss of cottonwood, birch and aspen woodlands is typical throughout southern British Columbia (Egan *et al.* 1997). These habitats are found along the major rivers and lakeshores where European settlement occurred in the late 1880s and 1900s, and were the first to be converted to urban and agricultural uses. This loss is ongoing but the rate is unknown.

In addition to direct habitat loss, degradation of these woodlands occurs through the removal of the mature trees that are required by the owls for roosting and nesting (Cannings and Davis 2007). Most older cottonwoods and birches in residential and park areas have been removed or drastically cut back to reduce the hazard of falling trunks and branches. Also, the rich shrub and forb understories of riparian woodlands are often cleared for suburban gardens and golf courses and regularly cleared and burned by ranchers to provide more grazing and comfortable shade for their cattle (J. Hobbs pers. comm. 2010). Excessive diversion of water from creeks for irrigation and other purposes may also affect the productivity of riparian woodlands downstream; this has apparently reduced cottonwood recruitment along Inkameep Creek near Oliver (R. Hall, pers. comm. 2005).

BIOLOGY

The Western Screech-Owl is nocturnal and non-migratory; pairs form long-term pair bonds and are territorial throughout the year (Cannings and Angell 2001). It is a generalist predator, feeding primarily on small mammals and large insects, but also small birds, fish, frogs, and slugs (Cannings and Angell 2001; Davis and Cannings 2008; Kissling *et al.* 2010).

Western Screech-Owl (*M. k. macfarlanei*) home ranges measured by Davis and Weir (2010) along the Shuswap River averaged 64.5 ha, with no substantial difference in size between males and females. Owls used considerably smaller areas during the breeding season (mean 20.4 ha) than the non-breeding season (mean 88.6 ha). Also, the ranges used by the male and female members of a pair overlapped extensively during the breeding season, but outside the breeding season very little overlap occurred within pairs. Home ranges in the West Kootenay (also *M. k. macfarlanei*) were considerably larger (D. Hausleitner, pers. comm. 2011) than those reported by Davis and Weir, averaging 193.4 ha through the entire year and 52.2 ha in the breeding season.

Life Cycle and Reproduction

Nesting usually begins in April (Campbell *et al.* 1990). The female lays 2-7 eggs (usually 3-5) in either a natural hollow in a tree, an old woodpecker nest cavity, or a nest box.

The longest-lived bird on record in the wild was a California bird that was almost 13 years of age (Clapp *et al.* 1983), while another in Idaho lived to 11 years (Cannings and Angell 2001). Average life span is likely much shorter. Breeding females and males in Idaho had an average life span after banding of 1.73 and 1.83 years respectively (Cannings and Angell 2001). The average generation time is therefore about 3 years.

Physiology and Adaptability

The Western Screech-Owl is found in almost every type of low elevation woodland habitat, including coniferous and deciduous forests and suburban gardens, as long as suitable roosting cover and nest sites are available (Cannings and Angell 2001). If there are no suitable tree cavities in an otherwise suitable territory, they will readily use nest boxes (Cannings and Angell 2001).

Dispersal and Migration

Western Screech-Owls are non-migratory; movement occurs as dispersal of juveniles in late summer (Cannings and Angell 2001). Ellsworth and Belthoff (1997) found that young screech-owls in Idaho disperse about 60 days after fledging (range 41-97 d, n=35); mean dispersal date 16 July (range 25 June to 25 August). On average, females travel about three times as far as males (mean of 14.7 km vs. 5.1 km) in the first three months of dispersal (Ellsworth and Belthoff 1997). The dispersal period is relatively short, and individuals settle after about six days (Belthoff and Dufty 1997). In the West Kootenay, natal dispersal for two individuals occurred approximately eight weeks after fledging and involved distances of 14 and 38 km respectively (D. Hausleitner, pers. comm. 2011).

Interspecific Interactions

Great Horned Owls (*Bubo virginianus*), Spotted Owls (*Strix occidentalis*), Barred Owls (*Strix varia*), and Raccoons (*Procyon lotor*) all prey on Western Screech-Owls (Johnsgard 1988; Cannings and Angell 2001). There is an increasing body of mostly anecdotal evidence suggesting that Barred Owl predation may be frequent and important. Evidence includes Barred Owls that fly in silently to playback of screech-owl calls (e.g. Levesque 2000), sightings of Barred Owls attacking a screech-owl (M. Kissling, pers. comm. 2011) and screech-owl skulls found in Barred Owl pellets (D. Fraser, pers. comm. 2011). This situation is particularly acute on the coast with *M. k. kennicottii*, but also occurs along the northern and eastern edges of the range of *M. k. macfarlanei* in the British Columbia interior. The Barred Owl arrived in the northeastern part of BC about 50 years ago through natural range expansion, and reached the coast in the mid-1960s; only in the 1980s did it become common in southwestern BC (Campbell *et al.* 1990). For more discussion on the impact that Barred Owls have had on Western Screech-Owl populations see Limiting Factors and Threats.

POPULATION SIZES AND TRENDS

Sampling Effort and Methods

For information on search effort from the Christmas Bird Count and British Columbia-Yukon Nocturnal Owl Survey, see the Search Effort section under Distribution.

M. k. kennicottii

Biologists working for Canadian Forest Products (and later Western Forest Products) censused owl populations, including the Western Screech-Owl, and studied associated habitat in the Nimpkish Valley area in northern Vancouver Island from 1995 to 1997 and again from 2002 through 2006 (Settingington 1998; Matkoski and Smith 2003; Smith 2003; Matkoski 2004, 2005, 2006). The Nimpkish studies involved counts at 430 points in 1995-1997 and three replicates of 10 survey routes of 10 points each in 2002 through 2006. The Nimpkish surveys used a playback protocol in which screech-owl recordings were played at each stop. Levesque (2000) conducted 17 hours of playback surveys around the University of Victoria campus on five nights from February through April 2000. In 2001, Preston and Campbell (2001) surveyed 24 transects along logging roads on Vancouver Island (561 stops over 859 km, including stops near Victoria, Nanaimo, Port Alberni, Courtenay, Campbell River, Port McNeill and the Nimpkish Valley) and 12 on the Sunshine Coast (156 stops over 230 km) using playback techniques for five species of owls including Western Screech-Owl. Elliott (2006) used playback at 22 known screech-owl sites in Metro Vancouver, visiting each site at least five times each from 1998 to 2002. Robertson *et al.* (2000) searched 26 sites in the Lower Mainland and on the Sunshine Coast during the day for roosting Western Screech-Owls from 1993 to 1998.

All this effort has probably surveyed less than 10% of suitable habitat on the British Columbia coast. However, Kissling and Lewis (2009) studied forest owls in southeastern Alaska using a variety of techniques including radio telemetry, and their detailed findings on the distribution and abundance of Western Screech-Owls can be extrapolated to some extent to provide information about screech-owls inhabiting the north coast of British Columbia, where the species remains unstudied.

M. k. macfarlanei

There has been a more thorough inventory for the interior subspecies of Western Screech-Owl, especially after it was listed as Endangered in 2002. As this species is more or less confined to linear riparian habitats along creeks, surveys targeted appropriate habitat throughout its Canadian range. Since 1996 almost every suitable site has been visited at least once. Cannings (1997) searched for screech-owls throughout the southern Interior of British Columbia between 5 April and 16 September 1996, using a playback protocol at 250 sites. In 2001, Hobbs (2002) revisited many of Cannings' sites in the Okanagan and found two more in Kelowna. This study was

followed in 2002 by Tripp (2003), who conducted 108 playback surveys at 93 sites in the Okanagan Valley. In 2003, Mylmyok and Hobbs (2003) surveyed 250 sites in the Okanagan, Boundary and West Kootenay regions. More Kootenay surveys were done in 2003, 2004 and 2005 (Beaucher and Dulisse 2004; Dulisse and Beaucher 2006); they reported on 607 call playback surveys at 392 sites. Davis and Weir (2008) conducted playback surveys at 193 sites, most revisited several times, in the north Okanagan and southeast Shuswap region in 2004-2008. Hobbs *et al.* (2006) carried out 234 playback surveys in the Thompson-Nicola region and 480 in the Okanagan region in 2006. Hausleitner *et al.* (2007) searched for Western Screech-Owls using playback along transects in the Carpenter Lake, Seton Lake and Gold Bridge areas along the northwestern edge of *M. k. macfarlanei* range in 2006. Young *et al.* (2010) resampled many of the latter sites as well as others in the Lillooet area (total of 486 stations) in spring 2010. In 2007, Ferguson and Iredale (2007) conducted 231 call-playback surveys in the Thompson Valley over 24 nights. In 2011, two additional sites were found in the southern Flathead Valley in extreme southeastern B.C. and at Nettie Creek in the Kootenays (J. Hobbs pers. comm. 2011).

Abundance

M. k. kennicottii

Preston and Campbell (2001) found 26 Western Screech-Owls on their Vancouver Island transects, a rate of one bird per 36 km (561 stops). They found no Western Screech-Owls on their Sunshine Coast transects (156 stops). Assuming they were detecting all male screech-owls within 0.8 km we can translate this into a density of one owl per 5515 ha. Then, using an estimate of 4.8 million ha for the area of suitable low elevation forest on the coast of British Columbia (GIS analysis of the area below 300 m elevation on the BC coast, shown in Figure 3), we can calculate an estimate of 870 pairs (1940 individuals) of Western Screech-Owls, *kennicottii* subspecies, in Canada. While this is a conservative estimate in some respects (Preston and Campbell likely missed some owls) it also assumes that densities are similar along the entire coast. In fact, densities likely decline moving north, considering encounter rates from the Nimpkish Valley (10.6%) compared with those in southeast Alaska (7.7%) (Matkoski 2006; Kissling *et al.* 2010), and the fact that densities on the northern mainland coast are likely significantly lower than they are on Vancouver Island, as is the case with populations in southeast Alaska (mainland vs. islands; M. Kissling, pers. comm. 2011). Also, much of the area around Vancouver and Victoria has few if any screech-owls (Elliott 2006). Considering the uncertainty in this estimate, it is perhaps best to estimate the population as 1500 to 3000 individuals, with the population most likely to be closer to 2000 individuals.

M. k. macfarlanei

Cannings and Davis (2007) estimated the breeding population of *M. k. macfarlanei* in British Columbia by analyzing 418 records and assigned each to unique sites. They considered owl sightings made within about 300 metres of each other to be at the same site. Considering only sightings made since 1990 during the breeding season (March through July), they estimated a total of 142 known sites. As screech-owl home ranges are larger than 300 metres in radius, this number of sites is liberal, i.e. some neighbouring sites may represent a single territory. J. Hobbs (unpubl. data 2012) has updated this database and, based on 676 sightings, considers that 186 sites represent possible or known breeding territories. However, breeding has been confirmed at only 44 sites, and only 94 sites have repeated (i.e. more than one) observations of owls. Based on these data and assumptions, 175-250 pairs (350-500 individuals) could be considered a reasonable estimate of the breeding population of *M. k. macfarlanei* in British Columbia.

Fluctuations and Trends

M. k. kennicottii

Christmas Bird Count data from the south coast of British Columbia provide evidence of a significant population decline of screech-owls in that area. Since CBCs began reporting owl survey effort data in 1983, the number of Western Screech-Owls on seven long-term counts (Duncan, Ladner, Nanaimo, Sunshine Coast, Vancouver, Victoria and White Rock) has dropped from a mean of one owl per hour to about one owl every 10 hours (Figure 5). The strongest decline happened between 1993 and 1994. Data from the British Columbia-Yukon Nocturnal Owl Survey shows a steep decline in Western Screech-Owl detections on the British Columbia coast between 2000 and 2004; there were no detections on that survey from 2005 to 2009 inclusive (Figure 6). All of the Christmas Bird Counts used in this analysis and all but two of the Nocturnal Owl Survey routes are from the south coast; there are no long-term data from the central or north coast regions. The south coast population represented at most 50% (assuming that habitat was much more suitable there than farther north) and perhaps has as little as 10 to 20% of the coastal population.

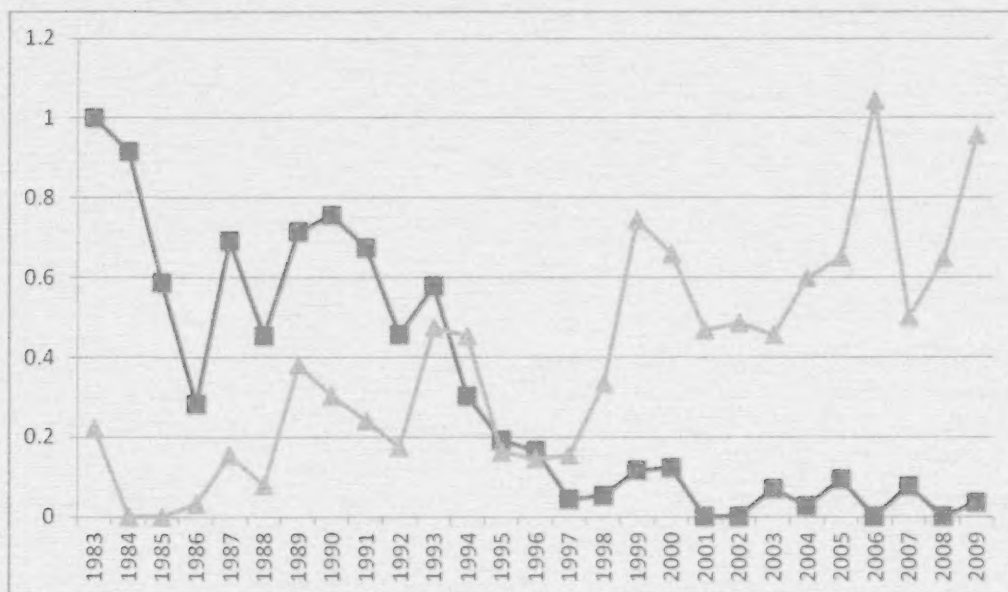


Figure 5. Frequency (owls per hour of nocturnal effort) of Western Screech-Owl (*M. k. kennicottii*) (squares) and Barred Owl (triangles) sightings on seven south coastal Christmas Bird Counts 1983-2009 (Duncan, Ladner, Nanaimo, Sunshine Coast, Vancouver, Victoria, White Rock).

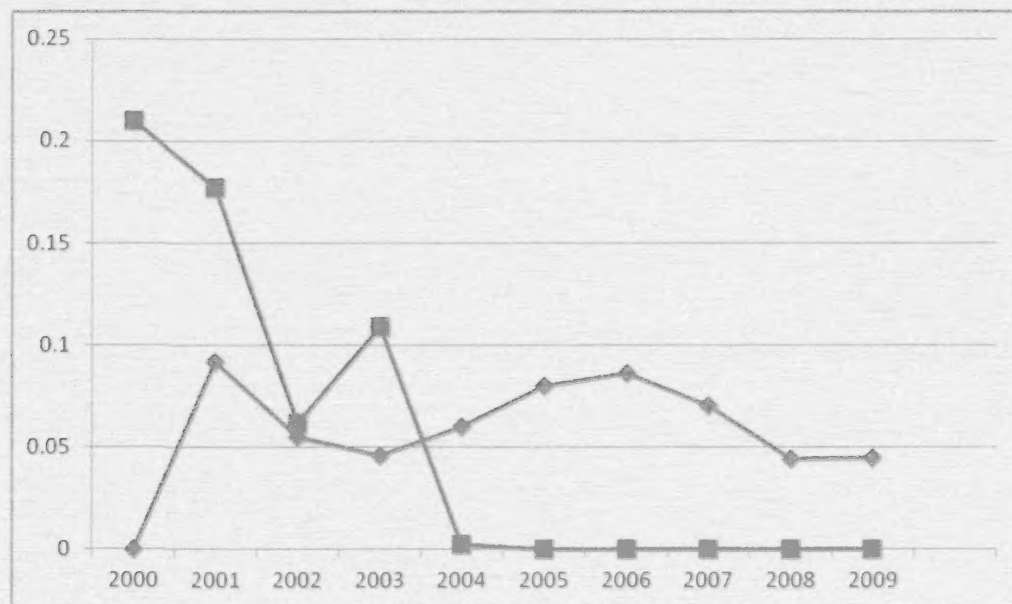


Figure 6. The frequency (owls per 10 stops) of Western Screech-Owl detections from coastal routes (squares) and southern interior routes (diamonds) on the BC-Yukon Nocturnal Owl Survey. Sample size for coastal routes ranges from 15 to 64 routes and from 25 to 55 for interior routes. Note: all but two coastal routes are from the south coast.

Robertson *et al.* (2000), during fieldwork from 1993 to 1998, found 22 Western Screech-Owls: 11 on the Sunshine Coast, 8 in the Fraser Valley and 3 on the north shore of Metro Vancouver.

Elliott (2006) monitored 22 historical screech-owl sites in Metro Vancouver, visiting each site at least five times (215 total visits) between 1998 and 2002. Between 1997 and 2000, he found screech-owls at 5 of the 22 sites, but could not find screech-owls at any of these sites in 2001 and 2002. A similar decline happened around the University of Victoria campus, where the population declined from 13 pairs in 1979 (Fraser 1979) to zero by the year 2000 (Levesque 2000).

Western Screech-Owl populations have also declined on the coast of Washington over the same time period (T. Angell, pers. comm. 2002); the number of screech-owls reported from seven long-term Christmas Bird Counts there declined from 32 in 1990 to 3 in 2009.

There has been no long-term monitoring for Western Screech-Owls in coastal British Columbia north of the Lower Mainland and southern Vancouver Island. The Nimpkish Valley studies found no significant declining trend over the four years from 2003 to 2006, but this might be expected considering the short time period involved.

Kissling *et al.* (2009) found that the occupancy of Western Screech-Owls increased by an estimated 35% between "historical" (1986-1992) and "current" (2005-2008) time periods in southeast Alaska, but the reliability of this estimate is suspect, considering the survey protocols were very different in the two time periods. In contrast, they also found that screech-owls disappeared from two of three study areas over the same time period, and M. Kissling (pers. comm. 2011) thinks that the species has almost surely declined in numbers in southern Alaska over the last 20 years.

In summary, this subspecies has declined drastically over the last 15 years on the south coast of British Columbia. In the Metro Vancouver area and southern Vancouver Island there are very few screech-owls remaining. These areas likely had some of the highest densities of screech-owls on the coast before 1985 (D. Fraser, pers. comm. 2011). Assuming that this part of the range once contained 20% of the population (based on the areal extent of the region and estimated densities), then the coastal population of the Western Screech-Owl has declined by at least that amount over the last 10 to 15 years. Considering habitat loss and survey results from similar parts of Alaska, it has also likely declined in central and north coastal forests as well, but the magnitude of the decline there is unknown. Any declines on the central and northern coasts would add to the decline on the south coast, so the Canadian population of this subspecies has probably declined by 20 to 30% over the last 10 to 15 years. This is clearly a rough estimate. The decline may have slowed in the last decade, but most monitoring is done on the south coast where there are very few individuals remaining.

M. k. macfarlanei

The interior populations of Western Screech-Owl likely declined significantly through the first half of the 1900s as habitat was lost (see Habitat Trends section). There is no evidence of a continuing decline in recent years, however, although data are scant. Christmas Bird Count data from five long-term Okanagan Valley counts suggest a stable population, although the number of screech-owls seen annually tends to be very low. Detection rates in the British Columbia-Yukon Nocturnal Owl Survey have remained relatively stable on 25 to 55 routes in the southern Interior of BC from 2001 through 2009 (Figure 6).

Cannings and Davis (2007) state that 5 of 155 sites where screech-owls have occurred historically in the BC interior during the breeding season no longer have owls.

Over the last decade, therefore, the Western Screech-Owl has declined drastically on the south coast of British Columbia and declined more moderately on the north coast, while populations in the southern interior of the province have remained relatively stable.

Rescue Effect

Western Screech-Owl populations occur in Alaska, Washington, Idaho and Montana contiguously with populations in British Columbia, so annual dispersal from the United States could be a source of rescue. As mentioned in the Trends section above, coastal populations (*M. k. kennicottii*) in Washington seem to have suffered the same drastic declines noticed in Metro Vancouver, and so may not be a good source. Similarly, declines in coastal Alaska may compromise it as a source of rescue (M. Kissling, pers. comm. 2011). Populations in eastern Washington, Idaho and Montana have not undergone the same recent declines, so could provide rescue for *M. k. macfarlanei* populations in the interior of British Columbia, if those populations have not been reduced through habitat loss.

THREATS AND LIMITING FACTORS

Habitat Loss

M. k. kennicottii

Forestry operations may negatively affect screech-owl habitat on the British Columbia coast by the removal of habitat through timber harvesting and through the removal of dead trees and snags, which serve as potential nest cavity trees. However, the relationship between Western Screech-Owls and forestry operations has not been closely studied; the owl surveys done in the Nimpkish Valley (e.g., Matkoski 2006) did not continue long enough to measure long-term impacts. Urban expansion has undoubtedly contributed to habitat loss as well, but this species has all but disappeared from most urban centres on the British Columbia coast despite the presence of good habitat (see Barred Owls below).

M. k. macfarlanei

Habitat loss and degradation is considered the most important factor limiting the screech-owl population in the British Columbia interior. The availability of tree cavities for nests and roosts is a critical component of any screech-owl territory, so the loss of large, mature trees in riparian habitats has reduced the suitability of much of the valley bottom habitat. These trees are often removed, especially so in parks where public safety is an issue, because mature cottonwoods in particular are considered a windfall hazard. Clearing the shrub understory from these riparian woodlands is also widespread (J. Hobbs, pers. comm. 2010), a practice that undoubtedly reduces the quantity and diversity of small prey suitable for screech-owls. This also reduces the recruitment of young cottonwoods for maintenance of these stands.

Barred Owls

The arrival and establishment of the Barred Owl as a resident breeding species in southern BC has coincided with a decline in screech-owl reports from the south coast of BC (Figure 5), leading to speculation that Barred Owls precipitated this decline, likely through direct predation (Cannings and Angell 2001). There are many reports of Barred Owls flying in silently to playback of screech-owl calls, presumably intent on predation (Levesque 2000; Elliott 2006).

Elliott (2006) analyzed Christmas Bird Count results from the southern coast of BC with regards to changes in Western Screech-Owls and Barred Owls. He found four significant relationships: counts with declining screech-owl numbers had higher Barred Owl relative abundance ($p = 0.05$); Barred Owls reached 50% of their final numbers earlier on count circles where screech-owls showed declines ($p = 0.0002$); screech-owls declined first on Christmas Bird Count circles where Barred Owls expanded most rapidly ($p = 0.01$) and where the final number of Barred Owls was highest ($p = 0.02$).

Elliott (2006) presented further evidence to strengthen the argument that Barred Owls have been the primary cause of the Western Screech-Owl's decline on the south coast. In his study, the last screech-owls to disappear were those in the smallest forest fragments in which Barred Owls were uncommon. He also discounted other theories, such as the effects of a newly introduced population of Eastern Grey Squirrels (*Sciurus carolinensis*) and habitat loss, because the screech-owls have declined in areas lacking the squirrels, and also in parks where habitat has been protected.

Farther north along the BC coast, the impact Barred Owls might be having on Western Screech-Owls is less clear. Western Screech-Owls were still well-distributed throughout the Nimpkish Valley in northern Vancouver Island from 1995 to 2006 despite the presence of a Barred Owl population (Settingington 1998; Matkoski and Smith 2003; Smith 2003; Matkoski 2004, 2005, 2006). Numbers of both species remained relatively stable between 1995 and 2006 (Settingington 1998; Matkoski 2006). Also on Vancouver Island, 16% of all owl detections in the Campbell River watershed were of Barred Owls and 28% were Western Screech-Owls (Mico and Van Enter 2000).

Unfortunately, no long-term data exist from northern Vancouver Island to compare present screech-owl numbers with populations from before the arrival of the Barred Owl in the late 1970s and 1980s. Studies in coastal Alaska, however, suggest that Barred Owls have impacted Western Screech-Owls there, implying that populations of *M. k. kennicottii* throughout the British Columbia coast have been impacted as well. Kissling and Lewis (2010) report that Western Screech-Owls were detected in three regions in southern Alaska between 1986 and 1992 (shortly after the arrival of Barred Owls there) but were no longer present in two of those regions in 2005-2008, while Barred Owls increased in numbers at both sites. They also found two screech-owl territories that were empty the following year, coincident with the arrival of Barred Owls (M. Kissling, pers. comm. 2011).

Barred Owls occur only at higher elevations in the Okanagan Valley, so probably do not come into contact with screech-owls very often there (Cannings *et al.* 1987), but along the Shuswap River and throughout much of the Kootenays they share valley bottom habitats. Barred Owls are therefore a serious threat to *M. k. kennicottii* populations on the coast, but only locally for *M. k. macfarlanei* populations in the interior.

Road Kill

Roads also contribute to deaths of screech-owls. Up to six road mortalities have been documented in one year in the South Okanagan and the actual total is likely much higher when undocumented incidents are factored in. This level of mortality could have a significant impact on a small population. Other studies have also documented the impact of road kills on screech-owls (Hatler *et al.* 1978).

PROTECTION, STATUS, AND RANKS

Legal Protection and Status

The Western Screech-Owl, *macfarlanei* subspecies, is listed as Endangered under the federal *Species at Risk Act*; the *kennicottii* subspecies is listed as Special Concern under the same legislation based on May 2002 COSEWIC assessments. Both taxa (and their nests and eggs) are protected from direct harm under the British Columbia *Wildlife Act*. *M. k. macfarlanei* is also listed as an Identified Wildlife Management Species under the *Forest and Range Practices Act* in British Columbia, meaning that Wildlife Habitat Areas can be designated for the taxon.

Non-Legal Status and Ranks

The Western Screech-Owl is ranked globally as G5 (secure; last reviewed 2003) (NatureServe 2010). Ranks from provinces and adjacent states are:

British Columbia: S4 (apparently secure)
Alaska: S2 (imperiled)
Washington: S4 (apparently secure)
Idaho: S3S4 (Rare or uncommon to apparently secure)
Montana: S4 (apparently secure)

It is also ranked as S1B, S1N (critically imperiled) in Saskatchewan, although it does not occur there regularly and there are no breeding records.

M. k. kennicottii is ranked as T4 globally (apparently secure; last reviewed 2003) and S3 in British Columbia (Blue List; special concern), while *M. k. macfarlanei* is ranked as T4 globally (last reviewed 2000) and S2 in British Columbia (Red List; potentially Threatened or Endangered). Both subspecies are given a priority ranking of 1 in the British Columbia Conservation Framework, suggesting that these taxa are considered in plans to retain biodiversity in British Columbia.

Habitat Protection and Ownership

M. k. kennicottii

On southern Vancouver Island and the mainland coast south of Powell River, most of the habitat suitable for Western Screech-Owls is privately owned. The species appears to no longer occur in a number of regional parks and provincial parks where it was once regularly found (e.g. Pacific Spirit Regional Park near Vancouver, Campbell Valley Regional Park in Langley, Goldstream Provincial Park near Victoria). It still occurs in Gulf Islands and Pacific Rim National Park Reserves. On northern Vancouver Island and the mainland coast north of Powell River, the majority of Western Screech-Owl habitat is provincial Crown land.

M. k. macfarlanei

The following information is from the Recovery Strategy for the Western Screech—Owl, *macfarlanei* subspecies (BC Ministry of Environment 2008). Approximately 16% of known *M. k. macfarlanei* sites in British Columbia are on conservation lands. These sites include Adams Bird Sanctuary, Summerland; Woodhaven Regional Park and Mission Greenway, Kelowna; Hardy Falls Regional Park, Peachland; Creston Valley Wildlife Management Area; Inkaneep Provincial Park, Oliver; Kalamalka Lake Provincial Park, Vernon; White Lake Grasslands Protected Area; and three Land Conservancy (TLC) covenants in the south Okanagan. One private land site has a stewardship agreement through TLC and at least five sites are being sensitively managed or enhanced in conjunction with TLC or the South Okanagan–Similkameen Stewardship Program. Fifteen Wildlife Habitat Areas have been approved for Western Screech-Owls on provincial Crown land in the British Columbia interior, totaling 771.6 ha. Three proposed Western Screech Owl WHAs for Thompson Region will result in the addition of 192 ha under IWMS. Consultation is complete and these sites are anticipated to receive protection by March 31, 2012.

ACKNOWLEDGEMENTS AND AUTHORITIES CONTACTED

The author would like to thank Helen Davis, Jakob Dulisse, Doris Hausleitner, Jared Hobbs and Michelle Kissling in particular for sharing their knowledge of this species with me in long and thoughtful discussions. John Deal provided full reports on owl surveys done in the Nimpkish Valley, and Dave Fraser and Leah Ramsay provided data from other coastal surveys.

Authorities contacted:

Tony Angell, Seattle, WA

Myke Chutter, BC Ministry of Natural Resources Operations., Victoria, BC

Helen Davis, Artemis Wildlife Consultants, Armstrong, BC

John Deal, Western Forest Products, Campbell River, BC

Jakob Dulisse, Seepanee Consulting, Nelson, BC

Orville Dyer, BC Ministry of Environment, Penticton, BC

David Fraser, BC Ministry of Environment, Victoria, BC

Ron Hall, Osoyoos Indian Band, Oliver, BC

Doris Hausleitner, Seepanee Consulting, Nelson, BC

Jared Hobbs, BC Ministry of Natural Resource Operations, Victoria, BC
Michelle Kissling, US Fish & Wildlife Service, Juneau, AK
Patrick Nantel, Parks Canada, Gatineau, QC
Leah Ramsay, BC Conservation Data Centre, Victoria, BC

INFORMATION SOURCES

- American Ornithologists' Union (AOU). 1957. Checklist of North American Birds. 5th edition.
- American Ornithologists' Union (AOU). 1983. Checklist of North American Birds. 6th edition.
- American Ornithologists' Union (AOU). 1998. Checklist of North American Birds. 7th edition. Washington D.C.
- Banks, R. C.; C. Cicero, J. L. Dunn, A. W. Kratter, P. C. Rasmussen, J. V. Remsen Jr., J. D. Rising, and D. F. Stotz. 2003: Forty-fourth supplement to the American Ornithologists' Union check-list of North American birds. *Auk* 120: 923-931.
- Beaucher, M.-A. and J. Dulisse. 2004. Western Screech-Owl inventory of the Central and West Kootenay Region: 2004 survey results. Unpub. report. Ministry of Water, Land and Air Protection, Nelson, BC.
- BC Ministry of Environment. 2008. Recovery strategy for the Western Screech-Owl, *macfarlanei* subspecies (*Megascops kennicottii macfarlanei*) in British Columbia. BC Ministry of Environment, Victoria, BC. 14 pp.
- Belthoff, J. R. and A. M. Duffy, Jr. 1997. Corticosterone and dispersal in Western Screech-Owls (*Otus kennicottii*). Pages 62-67 in Biology and conservation of owls of the Northern Hemisphere: 2nd International Symposium; 1997 February 5-9; Winnipeg, MB. (Duncan, J. R., D. H. Johnson, and T. H. Nicholls, Eds.) USDA For. Serv., North Central Res. Stn. Gen. Tech. Rep. NC-190, St. Paul, MN.
- Bent, A.C. 1938 (reprinted 1961). Life Histories of North American Birds of Prey (Part 2). Dover Publications, New York, New York.
- Campbell, R.W., N.K. Dawe, I. McTaggart-Cowan, J. M. Cooper, G. W. Kaiser, and M. C. E. McNall. 1990. The Birds of British Columbia, Volume 2. Royal British Columbia Museum, Victoria, BC. 359 pp.
- Cannings, R.A., R.J. Cannings, and S.G. Cannings. 1987. Birds of the Okanagan Valley. Royal British Columbia Museum, Victoria, BC 420 pp.
- Cannings, R.J. 1997. A survey of the Western Screech-Owl (*Otus kennicottii macfarlanei*) in the interior of British Columbia. Unpublished report. Ministry of Environment, Lands and Parks, Victoria, BC. 20 pp + appendices.
- Cannings, R. J. 2010. The 11th Annual BC-Yukon Nocturnal Owl Survey. Bird Studies Canada, Penticton, BC. 8 pp.

- Cannings, R. J., and T. Angell. 2001. Western Screech-Owl (*Otus kennicottii*). In The Birds of North America, No 597 (A. Poole and F. Gill eds.). The Birds of North America, Inc., Philadelphia, PA.
- Cannings, R. J. and H. Davis. 2007. Status of the Western Screech-Owl *macfarlanei* subspecies (*Megascops kennicottii macfarlanei*) in British Columbia. BC Ministry of Environment. Wildlife Working Report No. WR-112. Victoria, British Columbia.
- Clapp, R. B., M. K. Klimkiewicz, and A. G. Fitcher. 1983. Longevity records of North American birds: Columbidae through Paridae. Journal of Field Ornithology 54: 123-137.
- Davis, H., and R. J. Cannings. 2008. Diet of Western Screech-Owls in the interior of British Columbia. British Columbia Birds 18:19-22.
- Davis, H., and R. Weir. 2008. Western Screech-Owl conservation along the Shuswap River: Final report. Artemis Wildlife Consultants, Armstrong, BC. 97pp.
- Davis, H. and R. Weir. 2010. Home ranges and spatial organization of Western Screech-Owls in southern British Columbia. Northwestern Naturalist 91:157-164.
- Dulisse, J. and M.-A. Beaucher. 2006. 2005 Western Screech-Owl inventory of the Central and West Kootenay Region. Unpub. report, Columbia Basin Fish & Wildlife Compensation Program.
- Earhart, C.M. and N.K. Johnson. 1970. Size dimorphism and food habits of North American Owls. The Condor 72:251-264.
- Egan, B., C. Cadrin and S. Cannings. 1997. Cottonwood riparian ecosystems of the southern Interior. BC Ministry of Environment, Lands and Parks, Victoria, BC.
- Elliott, K. 2006. Declining numbers of Western Screech-Owl in the Lower Mainland of British Columbia. British Columbia Birds 14:2-11.
- Ellsworth, E., and J.R. Belthoff. 1997. Sex-biased dispersal of young Western Screech-Owls (*Otus kennicottii*) in southwestern Idaho. Pp. 155-159 in Biology and conservation of owls of the Northern Hemisphere: 2nd International Symposium; 1997 February 5-9; Winnipeg, MB (J. R. Duncan, D. H. Johnson and T. H. Nicholls, eds.). USDA Forest Service, North Central Research Station Gen. Tech. Rep. NC-190, St. Paul, MN.
- Federation of Alberta Naturalists. 2007. The Atlas of breeding birds of Alberta: a second look. Federation of Alberta Naturalists, Edmonton, AB. 626 pp.
- Ferguson, G. and F. Iredale. 2007. Inventory of Western Screech-Owl in the Thompson Region. BC Ministry of Environment. 13 pp.
- Fraser, D. F. 1979. Small owl use of the University of Victoria Campus. Student paper, Biology 329 Biology Dept., UVIC Victoria. 12pp
- Fraser, D. F., W. L. Harper, S. G. Cannings, and J. M. Cooper. 1999. Rare birds of British Columbia. Ministry of Environment, Lands and Parks, Victoria, BC.
- Godfrey, E.W. 1986. The Birds of Canada, revised edition. National Museums of Canada, Ottawa, Canada. 595 pp.

- Hatler, D. F., R. W. Campbell, and A. Dorst. 1978. Birds of Pacific Rim National Park. British Columbia Prov. Museum Occasional Paper 20, Victoria.
- Hausleitner, D, V. Young, and T. Tripp. 2007. Inventory and habitat enhancement of Western Screech and Flammulated Owls in the Bridge Coastal Study Area: Final Report. Unpub. report, BC Hydro Bridge Coastal Fish and Wildlife Restoration Program.
- Hayward, G.D., and E.O. Garton. 1988. Resource partitioning among forest owls in the River of No Return Wilderness, Idaho. *Oecologia* 75: 253-265.
- Hekstra, G. P. 1982. A revision of the American Screech Owls (*Otus*). Doct. Diss., Vrije Universiteit Amsterdam (Free University Amsterdam) 131 pp.
- Hobbs, J., B. Sawicz, R. Noble and I. Spendlow. 2006. Okanagan and Thompson-Nicola Regions western screech-owl (*Megascops kennicottii macfarlanei*) inventory – 2006. Unpublished report. BC Ministry of Environment, Penticton, British Columbia.
- Holroyd, S.L., M. Eggen, and S. Ross. 2000. Owl inventory in Clayoquot Sound, Vancouver Island 1997. Prepared for the BC Ministry of Environment Lands and Parks (MELP) (Region 1), and the BC Ministry of Forests (Research Branch). Unpublished report for MELP (Region 1) as part of the Forest Renewal BC Wildlife/Wildlife Habitat Inventory Program.
- Hull, C. L. 1999. COSEWIC Status Report Update on Marbled Murrelet *Brachyramphus marmoratus* (Gmelin). Report to Committee on the Status of Endangered Wildlife in Canada (COSEWIC).
- Johnsgard, P.A. 1988. North American Owls, Biology and Natural History. Smithsonian Institution Press, Washington D.C. 295 pp.
- Johnson, D.H. 1997. Wing-loading in 15 species of North American Owls. In J.R. Duncan, D.H. Johnson, and T. H. Nicholls, (eds.) *Biology and Conservation of Owls of the Northern Hemisphere*, 2nd International Symposium, February 5-9, 1997, Winnipeg, Manitoba, Canada. USDA Forest Service, General Technical Report NC-190.
- Kissling, M. L. and S. B. Lewis. 2009. Distribution, abundance and ecology of forest owls in Southeast Alaska. U.S. Fish and Wildlife Service, Juneau Field Office, Alaska, and Alaska Department of Fish and Game, Division of Wildlife Conservation, Douglas, Alaska. 215pp.
- Kissling, M. L., S. B. Lewis and D. A. Cushing. 2010. Diet of Western Screech-Owl in southeast Alaska. *Western Birds* 41:247–255.
- Levesque, P. 2000. The Bird Community of the University of Victoria. In M. Hocking. 2.1 Campus Ecology. Unpublished report. University of Victoria Sustainability Project. 66pp.
- Marshall, J.T. 1967. Parallel variation in North American and Middle American screech-owls. *Western Foundation of Vertebrate Zoology. Monograph* 1: 1-72.

- Matkoski, W. R. 2004. Monitoring forest owls in TFL 37, northern Vancouver Island: 2004. Unpublished report prepared for Canadian Forest Products, Woss, BC.
- Matkoski, W. R. 2005. Monitoring forest owls in TFL 37, northern Vancouver Island: 2005. Unpublished report prepared for Canadian Forest Products, Woss, BC.
- Matkoski, W. R. 2006. Monitoring forest owls in TFL 37, northern Vancouver Island: 2006. Unpublished report prepared for Western Forest Products, Campbell River, BC.
- Matkoski, W. R. and A. T. Smith. 2003. Monitoring forest owls in TFL 37, northern Vancouver Island: 2003. Unpublished report prepared for Canadian Forest Products, Woss, BC.
- Mico, M. and T. Van Enter. 2000. Campbell River watershed owl survey, year 2000. Unpublished report prepared for BC Hydro, Vancouver, BC 19 pp.
- Mylymok, J. and J. Hobbs. 2003. Inventory of Western Screech Owl (*O. k. macfarlanei*) in the Southern Interior of BC. Unpub. report, Ministry of Water, Land and Air Protection, Penticton, BC.
- NatureServe 2011: An online encyclopedia of life. Version 1.4. Arlington , Virginia, USA: Association for Biodiversity Information. Web site: www.natureserve.org. (accessed January 2011).
- Pinel, H.W., W.W. Smith, and C.R. Wershler. 1991. Alberta birds, 1971-1980. Vol. 1: Non-passerines. Provincial Museum of Alberta Natural History Occasional Paper 13. Edmonton, Alberta.
- Preston, M. I. and R. W. Campbell. 2001. Forest owls as indicators of retention of biodiversity in British Columbia. Unpubl. Rep., Weyerhaeuser, Nanaimo, BC. 31pp.
- Proudfoot, G. A., F. R. Gehlbach, and R. L. Honeycutt. 2007. Mitochondrial DNA variation and phylogeography of the Eastern and Western Screech-Owls. *Condor* 109:617-628.
- Robertson, I., M. Gebauer, G. Ryder, and R. Toochin. 2000. Observations of two species at risk in mainland southwestern British Columbia: Hutton's Vireo and Western Screech-Owl. Pp 267-273. in L.M. Darling (ed.) Proceedings of a Conference on the Biology and Management of Species and Habitats at Risk, Kamloops, BC 15-19 February, 1999. Volume 1. BC Ministry of Environment, Lands and Parks, Victoria, BC and College of the Caribou, Kamloops, BC
- Settlington, M. 1998. Owl abundance and habitat in the Nimpkish Valley, Vancouver Island. Unpublished report prepared for Canadian Forest Products Ltd., Woss, BC 97 pp.
- Sharp, P.L. 1973. Birds of Waterton Lakes National Park. Prepared for National and Historic Parks Branch by Canadian Wildlife Service, Edmonton.
- Smith, A.R. 1996. Atlas of Saskatchewan Birds. Special Publication No. 22, Saskatchewan Natural History Society (Nature Saskatchewan).

- Smith, A. T. 2003. Forest owl inventory in TFL 37: survey year 2002. Unpublished report prepared for Canadian Forest Products, Woss, BC.
- SOSCP. 2005. South Okanagan Similkameen Conservation Program Business Plan 2005-2006. Penticton, BC. 28 pp. http://www.soscp.org/reports/V11_B_PAGES_3-6_newest-pdf.pdf
- Tripp, T. 2003. Occurrence report update and identification of potential Wildlife Habitat Areas for the Red-listed subspecies of Western Screech-Owl (*Otus kennicottii macfarlanei*) in the Okanagan Valley of B. C. Unpub. report, Ministry of Water, Land and Air Protection, Victoria, BC.
- Young, V., J. Mylrmok, J. Hobbs, and F. Iredale. 2010. Western Screech-Owl conservation and management for the Bridge River Restoration Area: 2010 final report. BC Hydro Bridge Coastal Fish and Wildlife Restoration Program.

BIOGRAPHICAL SUMMARY OF REPORT WRITER(S)

Richard (Dick) Cannings was born and raised in the Okanagan Valley in a family keenly interested in natural history. This early involvement in birds, bugs and plants led him to a university education in zoology, including a BSc degree from the University of British Columbia and an MSc from Memorial University of Newfoundland. He worked for 15 years as the Curator of the Cowan Vertebrate Museum in the Department of Zoology at the University of British Columbia. He left UBC in 1995 to return to his Okanagan roots.

Dick now works half-time for Bird Studies Canada, coordinating Canadian Christmas Bird Counts, the eBird program and the British Columbia-Yukon Owl Survey. His consulting work is primarily centred on endangered species, particularly those in southern British Columbia. He was co-chair for birds on the Committee on the Status of Endangered Wildlife in Canada for eight years and has served on both the BC Environmental Appeal Board and the BC Forest Appeals Commission. He has written a number of books, including *The Birds of the Okanagan Valley, British Columbia* with brothers Sydney and Robert Cannings; *British Columbia: A Natural History* with Sydney Cannings, *The BC Roadside Naturalist*, *The Rockies: a Natural History*, and *An Enchantment of Birds*.

COLLECTIONS EXAMINED

No collections were examined for this report.